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U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

ATTENTION: Document Control Desk

SUBJECT: **R.E. Ginna Nuclear Power Plant**
Docket No. 50-244

2011 Steam Generator Tube Inspection Report

Attached is a copy of the document titled "Steam Generator Tube Inspection Report, End of Cycle 35 Refueling Outage, May 2011." This report is submitted in accordance with Section 5.6.7 of the Technical Specifications for the R.E. Ginna Nuclear Power Plant (Ginna).

Should you have questions regarding this document, please contact Thomas Harding at (585) 771-5219 or via e-mail at Thomas.HardingJr@cengllc.com.

Very truly yours,

(Stephen Fregoso) for

Thomas G. Mogren

Attachment: Steam Generator Tube Inspection Report

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COMMITMENTS IDENTIFIED IN THIS CORRESPONDENCE:

- None.

UFSAR/TSB Revision Required?

- No.

ATTACHMENT

STEAM GENERATOR TUBE INSPECTION REPORT

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R. E. Ginna Nuclear Power Plant, LLC

STEAM GENERATOR TUBE INSPECTION REPORT

END OF CYCLE 35 REFUELING OUTAGE

MAY 2011

1503 Lake Road
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1.0 INTRODUCTION

The R.E. Ginna Nuclear Power Plant (Ginna) design has two (2) re-circulating design steam generators (SG) designed and fabricated by Babcock and Wilcox (BWI) of Cambridge, Ontario, Canada. The nomenclature used for fabrication and subsequent in-service inspections is BWI #34 (SG-A) and BWI #35 (SG-B). Each BWI steam generator was designed to contain 4765 tubes. One tube in each steam generator was removed from service during fabrication by means of a shop welded Inconel 690 plug. SG-A contains 4764 open tubes, and SG-B had four (4) tubes plugged at End of Cyle(EOC 32) due to a loose part that brings the total to 4760 open tubes. The tubing material is thermally treated Inconel 690 having a nominal outer diameter (OD) of 0.750 inch and a nominal wall thickness of 0.043 inch. The nominal thickness of the tube sheet is 25.25 inches, with a full depth hydraulic expansion of all the tubes into the tube sheet material.

The tubes are supported in the straight section by eight 410 stainless steel lattice grid supports which are comprised of high, medium, and low bars. The tubes are supported in the U-bend by ten 410 stainless steel fan bar / collector bar assemblies.

Ginna Technical Specification (TS) 5.5.8.d provides the requirements for SG inspection frequencies. The TS requires that 100% of the tubes are to be inspected at sequential periods of 144, 108, 72, and, thereafter, 60 effective full power months (EFPM). Additionally, inspect 50% of the tubes by the refueling outage nearest the midpoint of the period and the remaining 50% by the refueling outage nearest the end of the period. At the beginning of the Ginna EOC 35 refueling outage, the Ginna steam generators were at 13.78 EFPY (165.36 EFPM). Therefore, the Ginna steam generators were at 21.36 EFPM within the second 108 EFPM inspection period.

In accordance with the Ginna TS 3.4.17, "Steam Generator (SG) Tube Integrity," Ginna TS 5.5.8, "Steam Generator (SG) Program," and American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code Section XI, 2004 Edition, IWB 2500-1, Examination category B-Q, item B16.20, SG eddy current examinations were performed during the Ginna EOC 35 refueling outage. All inspections were completed in accordance with Ginna TS 5.5.8.

2.0 SUMMARY

The EOC 35 2011 refueling outage (RFO) was the sixth in-service inspection of the Ginna SGs. The inspection was formally completed on June 1, 2011. Ginna entered Mode 4 on June 5, 2011. A degradation assessment was performed prior to the EOC 35 inspection to assure qualified inspection techniques would be used to detect existing and potential damage mechanisms.

The modes of tube degradation detected during the EOC 35 RFO were secondary side foreign object wear.

Foreign objects were detected on the tubesheet secondary face of both "A" and "B" steam generators (SG). A process was established to prioritize the removal of foreign objects, with the highest priority given to the foreign objects that posed a higher risk to tube integrity. Each foreign object that was detected and left in-service was evaluated in accordance with EPRI Steam Generator Integrity Assessment Guidelines, Revision 3, with Ginna SG plant-specific thermal performance inputs. The basis for leaving each foreign object in-service is the disposition of each foreign object evaluation.

Manufacturing anomalies were sampled with no detectable degradation and no detectable changes since the original SG manufacturing baseline.

In-service denting at the cold leg tubesheet secondary face was initially detected during the 2008 RFO and was again detected during the EOC 35 2011 examination. Denting is not considered degradation as defined in the EPRI Steam Generator Examination Guidelines. During the 2008 RFO eighty (80) tubes were identified with dents in the cold leg of SG-B and two (2) dented tubes in the cold leg of SG-A. The detected dent populations were based upon an approximately 58% bobbin-coil examination plan.

The 2011 RFO eddy-current bobbin-coil examination plan was designed to determine the extent of condition for denting at the tubesheet secondary face. This bobbin coil scope was essentially the same for both the "A" and "B" SG.

The 2011 bobbin examination identified two additional cold leg (C/L) top of tubesheet (TTS) dents in SG-A bringing the total to four dents detected in SG A. These dents are in the same bundle proximity of the C/L TTS dents recorded in 2008.

The 2011 bobbin examination identified two hundred and thirty seven (237) cold-leg top-of-tubesheet dents and one (1) hot-leg top–of-tubesheet dent in SG-B. There were one hundred and fifty six (156) newly reported cold-leg top-of-tubesheet dents. Of the newly reported dents, fifty four (54) were tested during the 2008 RFO. When the 2008 RFO data was reviewed again during the 2011 RFO, all of the newly reported 2011 RFO dents were detectable in the 2008 RFO data, but the signals were not reported during the 2008 RFO. The additional dents reported during the 2011 RFO were from increased scope as well as improved analyses which included additional discrimination between manufacturing and material parameters associated at the tubesheet secondary face and the onset of in-service denting. When comparing the 2008 RFO examination denting population to the 2011 RFO examination, there were no new tubes that were dented, just new dents reported due to examination scope and improved detection. The denting growth within specific tubes grew slightly with a mean bobbin-coil voltage growth of 0.52 volts. The denting is considered to be minor based upon bobbin-coil denting voltages and the ability to easily pass the nominal (0.610") probe diameter.

In addition to the bobbin coil examination, all SG A and SG B dents at the hot-leg and cold-leg top-of-tubesheet were inspected using a "D" probe. The "D" probe is a three coil probe containing a +Point coil, 0.115" pancake coil, and a non-surface riding 0.080" pancake coil. The data collected with the "D" probe was analyzed for potential degradation using the +Point and 0.115 pancake coil and no degradation was detected. The data was then analyzed using the Zetec AN software package. This software package contains the program to profile the dents by using the data from the non-surface-riding 0.080" pancake coil.

3.0 REPORT

3.1 Scope of Inspections Performed on each Steam Generator (TS 5.6.7.a.)

3.1.1 Primary Side Base Scope

Scope	SG- A	SG-B
Bobbin Probe: Full Length periphery, no tube lane, central box area, and inspection of historical anomalies	3241* 241 low rows tested H/L and C/L and 1 tube downsized for restriction Total tests: 3483	3224 261 low rows tested H/L and C/L Total tests: 3485
Rotating Probe: Periphery and no tube lane Hot Leg expansion transition (TSH ± 3")	535	534
Rotating Probe: Bounding of previous foreign objects evaluated but not removed, and manufacturing anomalies. Hot Leg expansion transition combination of extents (TSH ± 3"), (TSH +5"-3")	103	165
Rotating Probe: Periphery and no tube lane Cold Leg expansion transition (TSC ± 3")	535	534
Rotating Probe: Top of tubesheet dents detected in 2008 Cold Leg expansion transition (TSC +5"-3")	2	80
Divider plate / divider-plate weld visual inspection	1	1
100% Plug visual inspection	1 tube (2 plugs)	5 tubes (10 plugs)

*One tube in SG-A (not included in 3241) was restricted with a 0.610" diameter bobbin probe in the U-bend. This tube was tested along its full length with a combination bobbin coil and rotating coil examinations.

3.1.2 Primary Side Special Interest Scope (Scope Expansion)

Scope	SG-A	SG-B
Rotating Probe: Special interest - MBMs, DNTs, Bobbin special interest, tube-to-tube proximity	49	265
Ghent probe: Special interest top of tubesheet	5	0
Expansion for Bounding of new foreign objects and PLPs identified by FOSAR or Eddy-Current Hot-Leg expansion transition extents (TSH +5"-3")	268	250
Expansion for Bounding of new foreign objects and PLPs identified by FOSAR or Eddy-Current Cold-Leg expansion transition extents (TSC +5"-3")	4	76
Newly identified top-of-tubesheet denting Cold-Leg expansion transition (TSC +5"-3")	2	156
Newly identified top of tubesheet denting Hot-Leg expansion transition (TSH +5"-3")	0	1

3.1.3 Secondary Side Inspection Scope

All secondary side inspections were performed with the visual technique through a variety of remote tooling.

SG-A:

- Upper Internals Inspection
  - Primary and Secondary Moisture Separators, structural welds, etc.

- Upper Bundle Inspection
  - Tube bundle, tube support structures, structural components, etc.

- Feed Ring Examination
    - Nozzle impingement on shell area
    - Selected J tubes
    - Feed ring header ends inside and out

- FOSAR Inspection (top of tubesheet) prior to Sludge Lance

- TTS In-Bundle inspection prior to Sludge Lance

- FOSAR Inspection (top of tubesheet) Post-Sludge Lance
    - 100% of Annulus
    - 100% of No tube lane
    - Blowdown & drain holes
    - Shroud supports
    - Inspection of tube support structures

- TTS In-Bundle Inspection Post-Sludge Lance
    - Previously identified foreign objects
    - Eddy-current-detected potential loose parts (PLP)

SG-B:

- FOSAR Internals Inspection (top of tubesheet) prior to Sludge Lance

- TTS In-Bundle Inspection prior to Sludge Lance

- FOSAR Inspection (top of tubesheet) Post-Sludge Lance
    - 100% of Annulus
    - 100% of No tube lane
    - Blowdown & drain holes
    - Shroud Supports
    - Inspection of tube support structures

- TTS In-Bundle Inspection post-Sludge Lance
    - Previously identified foreign objects
    - Eddy-current-detected potential loose parts (PLP)

3.2 Active Degradation Mechanisms Found (TS 5.6.7.b.)

The only detected tube degradation was volumetric resulting from foreign object wear. There were a total of 4 wear locations in 3 tubes (1 new tube location detected in 2011). These were sized with the techniques in Table 1.

In addition, during the secondary side examinations in SG-A, flow accelerated corrosion was visually detected in 3 of 85 secondary steam separators. Follow-up ultrasonic 0 degree thickness exams validated that the extent of erosion is still within the secondary separator manufacturing and design tolerance.

3.3 Nondestructive Examination Techniques Utilized for each Degradation Mechanism (TS 5.6.7.c.)

See Table 1.

3.4 Location, Orientation (if Linear), and Measured Sizes (if Available) of Service-Induced Indications (TS 5.6.7.d.)

See Table 1.

Table 1

SG	Row	Col.	Location	Degradation Type	ETSS	NDE Measurement Parameter(s)
A	91	51	05H +0.34"	Volumetric	21998.1 + Point	29% through wall (TW), .10" length x .16" (25°) width using flaw peaks
A	53	85	02H +36.93" (0.5" below 03H)	Volumetric	27901.2 + Point	19% TW, .12" length x .16" (25°) width using flaw peaks
B	78	24	01H +0.91"	Volumetric	21998.1 + Point	25% TW, .14" length x .19" (29°) width using flaw peaks
B	78	24	01H +1.20"	Volumetric	21998.1 + Point	22% TW, 1.11" length x .19" (29°) width using flaw peaks

3.5 Number of Tubes Plugged During the Inspection Outage for each Active Degradation Mechanism (TS 5.6.7.e.)

There were no tubes that required removal from service by plugging during the Ginna 2011 RFO examination.

3.6 Total Number and Percentage of Tube Plugs to-Date (TS 5.6.7.f.)

See Table 2

Table 2

	SG-A	SG-B
Tubes plugged to date	1	5
Tubes Installed	4765	4765
% of tubes plugged to date	0.02%	0.10%

The tube plugging performed to-date included 1 tube in each SG during pre-service examinations. The additional 4 tubes plugged in the SG-B were from a foreign object that was not able to be removed during the 2005 RFO in-service examination.

3.7 The Results of Condition Monitoring, including the Results of Tube Pulls and In-Situ Testing (TS 5.6.7.g.)

A condition monitoring assessment was performed for each in-service degradation mechanism detected during the EOC 35 2011 RFO SG examination. The condition monitoring assessment was performed in accordance with Ginna TS 5.5.8.a, NEI-97-06, EPRI Steam Generator Integrity Assessment Guidelines, Revision 3, and the EPRI Steam Generator Degradation Specific Management Flaw Handbook, Revision 1. For each identified degradation mechanism, the as-found condition was compared to the appropriate performance criteria for tube integrity, accident induced leakage and operational leakage as defined in TS 5.5.8.b. For each damage mechanism a tube structural limit was determined to ensure that SG tube integrity would be maintained over the full range of operating conditions and design basis accidents. This included retaining a safety factor of 3.0 against burst under normal steady-state full power operation primary-to-secondary pressure differential and a safety factor of 1.4 against burst under the limiting design basis accident pressure differential.

The as-found condition of each degradation mechanism found during the EOC 35 RFO was shown to meet the appropriate limiting structural integrity performance parameter with a probability of 0.95 at 50% confidence level, including consideration of relevant uncertainties.

The following section provides a summary of the condition monitoring assessment for each damage mechanism.

The largest foreign object wear indication found during EOC 35 2011 RFO examination was 29% TW as measured by the EPRI Appendix H qualified technique 21998.1. This indication was 0.10" axial length x 0.16" circumferential width. The EPRI Steam Generator Degradation Specific Management Flaw Handbook, Revision 1, provides the methodology for the determination of structural limits and condition monitoring limits for various types of tube degradation. Following the flaw handbook methodology that discusses the structural limit for volumetric flaws of a given axial extent and limited circumferential extent (less than 135 degrees), the condition monitoring limit of 46% TW--which includes the total system uncertainty--is well above the 29% TW NDE sizing.

There were no tube pulls or in-situ pressure testing performed during the EOC 35 2011 RFO.

4.0 ACRONYMS

ASME	American Society of Mechanical Engineers
C/L	Cold Leg
TS	Technical Specification
EFPM	Effective Full Power Months
EFPY	Effective Full Power Years
EOC	End of Cycle
EPRI	Electrical Power and Research Institute
ETSS	Examination Technique Specification Sheet
FOSAR	Foreign Object Search and Retrieval
H/L	Hot Leg
NEI	Nuclear Energy Institute
PLP	Potential Loose Part
SG	Steam Generator
TSC	Tubesheet Cold
TSH	Tubesheet Hot
TTS	Top of Tubesheet
TW	Through-Wall

5.0 REFERENCES

5.1 Ginna Technical Specifications

5.2 ASME Section XI, 2004 Edition

5.3 Constellation Nuclear Generation Nuclear Directive, Fleet Steam Generator Program, CNG-AM-7.01

5.4 Steam Generator Program Guidelines, Nuclear Energy Institute, NEI 97-06, Revision 2

5.5 EPRI PWR Steam Generator Examination Guidelines, Revision 7

5.6 EPRI Steam Generator Integrity Assessment Guidelines, Revision 3

5.7 EPRI Steam Generator Degradation Specific Management Flaw Handbook, Revision 1